# SEMESTER-II

**COURSE 3: DIFFERENTIAL EQUATIONS**

Theory Credits: 4 5 hrs/week

# Course Outcomes

After successful completion of this course, the student will be able to

* 1. solve first order first degree linear differential equations.
  2. convert a non-exact homogeneous equation to exact differential equation by using an integrating factor.
  3. know the methods of finding solution of a differential equation of first order but not of first degree.
  4. solve higher-order linear differential equations for both homogeneous and non-homogeneous, with constant coefficients.
  5. understand and apply the appropriate methods for solving higher order differential equations.

# Course Content

**Unit – 1**

# Differential Equations of first order and first degree

Linear Differential Equations – Bernoulli’s Equations - Exact Differential Equations –Integrating factors - Equations reducible to Exact Equations by Integrating Factors -

i) Inspection Method ii) 1

*Mx*  *Ny*

iii) 1

*Mx*  *Ny*

# Unit – 2

**Differential Equations of first order but not of first degree**

Equations solvable for 𝑝, Equations solvable for 𝑦, Equations solvable for 𝑥 – Clairaut’s equation - Orthogonal Trajectories: Cartesian and Polar forms.

# Unit – 3

**Higher order linear differential equations**

Solutions of homogeneous linear differential equations of order 𝑛 with constant coefficients - Solutions of non-homogeneous linear differential equations with constant coefficients by means of polynomial operators

(i)

Q(x) =

eax

(ii) 𝑄(𝑥) = 𝑆𝑖𝑛 𝑎𝑥 (or) 𝐶𝑜𝑠 𝑎𝑥

# Unit – 4

**Higher order linear differential equations (continued.)**

Solution to a non-homogeneous linear differential equation with constant coefficients

P.I. of 𝑓(𝐷)𝑦 = 𝑄 when 𝑄 = 𝑏𝑥𝑘

P.I. of 𝑓(𝐷)𝑦 = 𝑄 when 𝑄 = 𝑒𝑎𝑥𝑉**,** where 𝑉 is a function of 𝑥

* 1. of 𝑓(𝐷)𝑦 = 𝑄 when 𝑄 = 𝑥𝑉**,** where 𝑉 is a function of 𝑥

# Unit – 5

**Higher order linear differential equations with non-constant coefficients**

Linear differential Equations with non-constant coefficients; Cauchy-Euler Equation; Legendre Equation; Method of variation of parameters

# Activities

Seminar/ Quiz/ Assignments/ Applications of Differential Equations to Real life Problem /Problem Solving Sessions.

# Text Book

Differential Equations and Their Applications by Zafar Ahsan, published by Prentice-Hall of India Pvt. Ltd, New Delhi-Second edition.

# Reference Books

* + 1. Ordinary and Partial Differential Equations by Dr. M.D. Raisinghania, published by S. Chand &Company, New Delhi.
    2. Differential Equations with applications and programs – S. Balachandra Rao & HR Anuradha- Universities Press.
    3. Differential Equations -Srinivas Vangala&Madhu Rajesh, published by Spectrum University Press.

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